

CLAIMS

What is claimed is:

- 1        1. A hard disk drive, comprising:
  - 2            a housing;
  - 3            a spindle motor coupled to said housing;
  - 4            a disk coupled to said spindle motor, said disk having
  - 5            a middle diameter and an outer diameter;
  - 6            an actuator arm coupled to said housing;
  - 7            a head coupled to said actuator arm;
  - 8            a voice coil motor coupled to said actuator arm;
  - 9            a crash stop that makes contact with and impedes a
  - 10          movement of said actuator arm; and,
  - 11          - a control circuit that controls said voice coil motor
  - 12          to move said head from said middle diameter to said outer
  - 13          diameter of said disk and then decelerate movement of said
  - 14          head as said actuator arm.
- 1        2. The drive of claim 1, wherein said voice coil motor
- 2          remains energized for a time interval after said head
- 3          passes said outer diameter of said disk.

1       3. The drive of claim 1, further comprising a ramp  
2 that receives said head.

1       4. The drive of claim 3, wherein said head is  
2 decelerated while said head moves across said ramp.

1       5. The drive of claim 1, wherein movement of said head  
2 across said disk is controlled by reading a Gray code of  
3 said disk.

1       6. The drive of claim 1, wherein movement of said  
2 head across said disk is controlled by sensing a back emf  
3 of said voice coil motor.

1       7. The drive of claim 1, wherein movement of said  
2 head beyond said outer diameter of said disk is controlled  
3 by sensing a back emf of said voice coil motor.

1       8. The drive of claim 1, wherein said head is  
2 decelerated by applying a reverse current to said voice  
3 coil motor.

1       9. The drive of claim 5, wherein movement of said head  
2 beyond said outer diameter of said disk is controlled by  
3 sensing a back emf of said voice coil motor.

1       10. The drive of claim 2, wherein movement of said  
2 head across said disk is controlled by reading a Gray code  
3 of said disk.

1       11. The drive of claim 2, wherein movement of said  
2 head across said disk is controlled by sensing a back emf  
3 of said voice coil motor.

1       12. The drive of claim 10, wherein movement of said  
2 head beyond said outer diameter of said disk is controlled  
3 by sensing a back emf of said voice coil motor.

1       13. A hard disk drive, comprising:  
2           a housing;  
3           a spindle motor coupled to said housing;  
4           a disk coupled to said spindle motor, said disk having  
5           a middle diameter and an outer diameter;

6       an actuator arm coupled to said housing;  
7       a head coupled to said actuator arm;  
8       a voice coil motor coupled to said actuator arm;  
9       a crash stop that makes contact with and impedes a  
10      movement of said actuator arm; and,  
11       control means for controlling said voice coil motor to  
12      move said head from said middle diameter to said outer  
13      diameter of said disk and then decelerate movement of said  
14      head as said actuator arm.

1       14. The drive of claim 13, wherein said voice coil  
2      motor remains energized for a time interval after said head  
3      passes said outer diameter of said disk.

1       15. The drive of claim 13, further comprising a ramp  
2      that receives said head.

1       16. The drive of claim 15, wherein said head is  
2      decelerated while said head moves across said ramp.

1       17. The drive of claim 13, wherein movement of said  
2 head across said disk is controlled by reading a Gray code  
3 of said disk.

1       18. The drive of claim 13, wherein movement of said  
2 head across said disk is controlled by sensing a back emf  
3 of said voice coil motor.

1       19. The drive of claim 13, wherein movement of said  
2 head beyond said outer diameter of said disk is controlled  
3 by sensing a back emf of said voice coil motor.

1       20. The drive of claim 13, wherein said head is  
2 decelerated by applying a reverse current to said voice  
3 coil motor.

1       21. The drive of claim 17, wherein movement of said  
2 head beyond said outer diameter of said disk is controlled  
3 by sensing a back emf of said voice coil motor.

1       22. The drive of claim 14, wherein movement of said  
2 head across said disk is controlled by reading a Gray code  
3 of said disk.

1       23. The drive of claim 14, wherein movement of said  
2 head across said disk is controlled by sensing a back emf  
3 of said voice coil motor.

1       24. The drive of claim 23, wherein movement of said  
2 head beyond said outer diameter of said disk is controlled  
3 by sensing a back emf of said voice coil motor.

1       25. A hard disk drive, comprising:  
2           a housing;  
3           a spindle motor coupled to said housing;  
4           a disk coupled to said spindle motor, said disk having  
5           a middle diameter and an outer diameter;  
6           an actuator arm coupled to said housing;  
7           a head coupled to said actuator arm;  
8           a voice coil motor coupled to said actuator arm;

9       a crash stop that makes contact with and impedes a  
10      movement of said actuator arm;

11       a controller coupled to said voice coil motor; and,  
12       a memory that contains a program that causes said  
13      controller to control said voice coil motor to move said  
14      head from said middle diameter to said outer diameter of  
15      said disk and then decelerate movement of said head.

1       26. The drive of claim 25, wherein said voice coil  
2      motor remains energized for a time interval after said head  
3      passes said outer diameter of said disk.

1       27. The drive of claim 25, further comprising a ramp  
2      that receives said head.

1       28. The drive of claim 27, wherein said head is  
2      decelerated while said head moves across said ramp.

1       29. The drive of claim 25, wherein movement of said  
2      head across said disk is controlled by reading a Gray code  
3      of said disk.

1       30. The drive of claim 25, wherein movement of said  
2 head across said disk is controlled by sensing a back emf  
3 of said voice coil motor.

1       31. The drive of claim 25, wherein movement of said  
2 head beyond said outer diameter of said disk is controlled  
3 by sensing a back emf of said voice coil motor.

1       32. The drive of claim 25, wherein said head is  
2 decelerated by applying a reverse current to said voice  
3 coil motor.

1       33. The drive of claim 29, wherein movement of said  
2 head beyond said outer diameter of said disk is controlled  
3 by sensing a back emf of said voice coil motor.

1       34. The drive of claim 26, wherein movement of said  
2 head across said disk is controlled by reading a Gray code  
3 of said disk.

1       35. The drive of claim 26, wherein movement of said  
2 head across said disk is controlled by sensing a back emf  
3 of said voice coil motor.

1       36. The drive of claim 34, wherein movement of said  
2 head beyond said outer diameter of said disk is controlled  
3 by sensing a back emf of said voice coil motor.

1       37. A method for moving a head of a hard disk drive  
2 off of a disk, the head is coupled to an actuator arm,  
3 comprising:

4           moving the head from a middle diameter of the disk to  
5 an outer diameter of the disk; and,  
6           decelerating the head as the actuator arm moves beyond  
7 the outer diameter of the disk.

1       38. The method of claim 37, wherein the head is moved  
2 with a voice coil motor and the voice coil motor remains  
3 energized for a time interval after the head passes the  
4 outer diameter of said disk.

1       39. The method of claim 37, wherein the head moves  
2 onto a ramp.

1       40. The method of claim 39, wherein the head is  
2 decelerated while the head moves across the ramp.

1       41. The method of claim 37, wherein movement of the  
2 head across the disk is controlled by reading a Gray code  
3 of the disk.

1       42. The method of claim 37, wherein movement of the  
2 head across the disk is controlled by sensing a back emf of  
3 the voice coil motor.

1       43. The method of claim 37, wherein movement of the  
2 head beyond the outer diameter of the disk is controlled by  
3 sensing a back emf of the voice coil motor.

1       44. The method of claim 37, wherein the head is  
2 decelerated by applying a reverse current to the voice coil  
3 motor.

1       45. The method of claim 41, wherein movement of the  
2 head beyond the outer diameter of the disk is controlled by  
3 sensing a back emf of the voice coil motor.

1       46. The method of claim 38, wherein movement of the  
2 head across the disk is controlled by reading a Gray code  
3 of the disk.

1       47. The method of claim 38, wherein movement of the  
2 head across the disk is controlled by sensing a back emf of  
3 the voice coil motor.

1       48. The method of claim 46, wherein movement of the  
2 head beyond the outer diameter of the disk is controlled by  
3 sensing a back emf of the voice coil motor.